

**REMARKS**

Claims 1-12, 14, 16 and 17 are pending in this application.

Claims 13 and 15 have been cancelled.

Support for the specific arylbenzofuranones recited in claim 1 can be found on page 8, lines 5-11.

Support for the amendment to claim 7 can be found in cancelled claim 13.

Support for new claims 16-17 can be found in the paragraph bridging pages 6-7 and in the paragraph bridging pages 8-9.

No new matter has been added by way of the above-amendment.

**ISSUES UNDER 35 U.S.C. 112, First Paragraph**

Claims 1-14 remain rejected and claim 15 is newly rejected under 35 U.S.C. 112, first paragraph.

Applicants respectfully traverse the rejection.

Specifically, the Examiner objects to the embodiment of the inventive claims wherein  $R_1$  of Formula (I) is a substituted or unsubstituted heterocyclic aromatic group. The Examiner finds that the present specification provides enablement for the inventive composition when  $R_1$  is a substituted or unsubstituted carbocyclic aromatic group but does not provide sufficient enablement under 35 U.S.C. 112, 1<sup>st</sup> paragraph when  $R_1$  represents a substituted or unsubstituted heterocyclic aromatic group.

Applicants respectfully submit that there is sufficient enablement for the skilled artisan provided in the specification to make and/or use the present invention wherein  $R_1$  is a heterocyclic aromatic group. However, in order to advance prosecution, Applicants have amended claim 1 to be limited to specific arylbenzofuranones wherein the moiety that is equivalent to  $R_1$  of Formula (I) is a carbocyclic aromatic group.

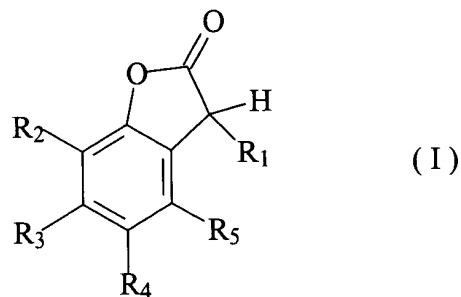
Accordingly, withdrawal of the rejection is respectfully requested.

ISSUES UNDER 35 USC 102

Claims 1, 2, 4, 6-9 and 15 are rejected under 35 U.S.C. 102(b) as being anticipated by Hinsken et al. US 4,338,244.

Applicants **respectfully traverse** the rejection.

In the present invention, the heat deterioration inhibitor is restricted to one or more of the following compounds



Compound	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>
1	2,4-dimethylphenyl	t-butyl	H	t-butyl	H
2	2,5-dimethylphenyl	t-butyl	H	t-butyl	H
3	3,4-dimethylphenyl	t-butyl	H	t-butyl	H

As the Examiner will note from the exemplified embodiments beginning at column 16 of Hinsken et al., none of the three compounds cited in the table provided above were placed in the possession of the public by Hinsken et al. Accordingly, Hinsken et al. do not anticipate the invention defined in claim 1, as presently amended.

Furthermore, Hinsken et al. fail to teach or fairly suggest that the residual amount of the aromatic monovinyl monomer in the aromatic monovinyl resin composition is not more than 100 ppm, as recited in present claim 1.

Applicants respectfully submit that the invention of claims 2 and 10 are further removed from Hinsken et al, since Hinsken et al. fail to teach or fairly suggest that the total residual amount of a dimer and a trimer of the aromatic monovinyl monomer in the aromatic monovinyl resin composition is not more than 0.4% by weight.

Applicants respectfully submit that the invention of claims 7-9 are further removed from Hinsken et al; since Hinsken et al. fail

to teach or fairly suggest that the 3-arylbenzofuranone is added at the polymerization step when polymerization rate of the aromatic monovinyl monomer is 50% or more, or at the devolatilization step, or after completion of the polymerization step and before the devolatilization step.

In describing the requirements for rejection of a claim by anticipation, the Manual of Patent Examining Procedure (Section 2131) states:

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference (ref. omitted). The identical invention must be shown in as complete detail as is contained in the... claim (ref. omitted)."

Accordingly, Applicants respectfully indicate, every element in a claim must be found in the reference in order that the reference anticipates the claim. Since none of the three compounds cited in the table provided above were explicitly or inherently described by Hinsken et al., the reference does not anticipate the claims, and as such, Applicants respectfully request that the rejection be withdrawn.

#### ISSUES UNDER 35 USC 103

Claims 3-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hinsken et al.

Applicants respectfully traverse the rejection.

Advantages of the present invention:

The present inventors succeeded, for the first time, in obtaining an aromatic monovinyl resin composition having an aromatic vinyl monomer content of not more than 100 ppm by adding a specific heat deterioration inhibitor, which is at least one of the arylbenzofuranones described in the above-table in a specific amount. In an embodiment of the present invention, the arylbenzofuranone(s) is added at a specific time during the polymerization process (i.e., at the time that polymerization rate of the aromatic monovinyl monomer is 50% or more at the polymerization step, or after completion of the polymerization step and before the devolatilization step, or at the devolatilization step as described in inventive claims 7-9).

In other words, the present inventors found that it is possible to effectively inhibit the generation of the aromatic vinyl monomer caused by the decomposition of the styrene monomer when a specific heat deterioration inhibitor of arylbenzofuranone coexists at heat polymerization of not less than 50% of styrene or at devolatilization while melting and kneading with heating.

Based on this finding, the present inventors have further succeeded in obtaining a styrene resin composition having an aromatic vinyl monomer content of not more than 100 ppm and having very little impurities, which was difficult to obtain by the

conventional polymerization method. According to the present invention, such a styrene resin composition can be obtained without particularly specialized methods by means of a conventional production apparatus.

Patentable distinctions between the disclosure of Hinsken et al. and the present invention:

The Examples of Hinsken et al. and the present invention are very different from each other in the types of resin used (see inventive claim 16), the kinds of heat deterioration inhibitor used (see inventive claim 1) and the timing of addition of the heat deterioration inhibitor (see inventive claims 7-9). In short, the present invention especially relates to the styrene resin of the thermoplastic resins.

A case, which is instructive on the facts of this case is In re Baird, 29 USPQ2d 1550 (CAFC 1994).

In Baird, there was an application claim for a flash fusible toner prepared using a bisphenol A. The Examiner rejected the application claim based upon a reference which taught a genus containing an estimated 100 million different diphenols simply because the reference genus encompassed bisphenol A. The Federal Circuit thought otherwise and overturned the Examiner's rejection.

Important facts which led to the court's conclusion were that the reference cited by the Examiner taught a genus containing a

large number of variables and only one of which was bisphenol A. There was nothing in the disclosure of the reference to suggest that one would select the specific variables necessary to obtain bisphenol A. In fact, the specific examples appeared to teach away from the relatively simple formula of bisphenol A, since the specific examples had more complex formulas. The court reasoned that while the reference may suggest certain complex bisphenol A derivatives, it did not fairly suggest bisphenol A and therefore did not motivate the selection of bisphenol A.

In the instant case, the Examiner has taken the same latitude with respect to what is obvious as was taken by the Examiner in Baird.

In Baird, bisphenol A was generically mentioned as a possible compound. However, in view of the large genus and the fact that all of the examples were structurally more complex than bisphenol A, the court found that the skilled artisan would not be motivated to choose bisphenol A. In the instant case, the three specific arylbenzofuranone compounds are generically encompassed by the large genus of compounds described by Hinsken et al. beginning at column 1, line 29. However, similar to Baird, the instant three specific arylbenzofuranones are simple compounds having a single benzofuranone moiety, whereas each of the working embodiments of Hinsken et al. (compounds nos. 1-10 shown at the bottom of column 18) are structurally more complex and have more than one

benzofuranone moiety. Accordingly, a *prima facie* case of obviousness cannot be said to exist without some additional guidance provided by Hinsken et al. to lead the skilled artisan to the inventive product.

Furthermore, as described on page 6, lines 17-18 of the specification, the styrene resin of the present invention does not include acrylonitrile as a copolymerizable monomer. Therefore, the ABS resin which is described in EXAMPLE D of Hinsken et al. is different from the styrene resin in the present invention. Also, the stabilizer which is added to the ABS resin of EXAMPLE D of Hinsken et al. is different from the specific heat deterioration inhibitor in the present invention in terms of chemical structure.

Therefore, it would not have been obvious, based on the reference, especially on EXAMPLE D thereof, for a person skilled in the art to reach the present invention such that the styrene resin including very little amount of aromatic vinyl monomer is obtained by using with heat deterioration inhibitor of the specific arylbenzofuranone of the present invention.

In view of the fact that the Hinsken et al. (US 4,338,244) is different from the present invention in kinds of resin (claim 16), kinds of heat deterioration inhibitors (claim 1) and the timing of addition of the heat deterioration inhibitor (claims 7-9) and Hinsken et al. fail to teach or fairly suggest the aromatic vinyl monomer content of the aromatic monovinyl resin composition of not



more than 100 ppm (claim 1) can be obtained, the present invention would not have been obvious for a person skilled in the art.

Even assuming *arguendo* that a *prima facie* case were to exist of claims 7-9 over the teachings of Hinsken et al., Applicants respectfully submit that the experimental data in the present specification is evidence that the present invention of claims 7-9 is not obvious.

Hinsken et al. show that the timing of addition of the deterioration inhibitor (which is referred to as a "stabilizer" in the reference) is not limited (see e.g. column 14, lines 22-27). However, the present inventors have surprisingly found (as shown in Comparative Example 18) that by adding the heat deterioration inhibitor before the polymerization (see table 1 below, and see inventive claims 7-9), the aromatic vinyl monomer content of the aromatic monovinyl resin composition is more than 100 ppm, which is outside the range of present claim 1.

Table 1

	Heat deterioration inhibitor			Mixing apparatus	Temperature of polymerization solution (°C)	Residual amount of styrene in pellet discharged from polymerization apparatus (ppm)
	Kind *1	Amount (wt %)	Position of addition			
Ex. 2	ABF1	0.05	Outlet of the third reactor	Used	150	57
Ex. 4	ABF1	0.05	Between extruders	Used	150	59
Ex. 32	ABF1	0.05	The third reactor	Used	150	62
Comp. Ex. 18	ABF1	0.05	Inlet of the first reactor	Used	150	167

\*1 ABF1: 5,7-di-tert-butyl-3-(3,4-dimethylphenyl)-3H-benzofuran-2-one

The present inventors believe that this reduction in effectiveness of the heat deterioration inhibitor arises as a result of the fact that the heat deterioration inhibitor is decomposed and consumed by a large amount of radicals occurring at the initial polymerization step when the heat deterioration inhibitor is added before the polymerization step or when polymerization rate of the aromatic monovinyl monomer is not less than 50%. Since this fact is neither taught nor suggested by

Hinsken et al., the invention of claims 7-9 is not made obvious by Hinsken et al.

Conclusion

In view of the above amendments and comments, Applicants respectfully submit that the claims are in condition for allowance. However, should the Examiner find to the contrary, Applicants respectfully request that the Examiner enters this amendment into the official record to place the claims in better form for appeal.


If the Examiner has any questions concerning this application, he is requested to contact **Garth M. Dahlen, Ph.D., Esq.** (#43,575) at the offices of Birch, Stewart, Kolasch & Birch, LLP.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees

required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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